

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025

**Product Approval Supporting Calculations
Alternative Anchorage Analysis & Design
R1 - Admin Update**

Project Number: MS24-12004

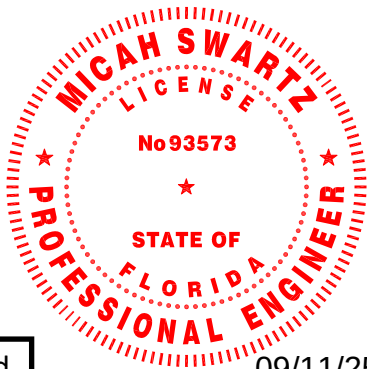
Drawing Number: D014679

Reference Test Report: G6813.10-301-47

Product Name: V-4500 Sliding Vinyl Door 281.125" x 96"

Prepared for:

Jeld-Wen Windows & Doors
3737 Lakeport Blvd.
Klamath Falls, OR



09/11/25

Prepared by:
Micah Swartz, P.E.

A handwritten signature in blue ink that reads "Micah Swartz".

Micah Swartz, PE
Florida License No. PE 93573

This item has been digitally signed and sealed by Micah Swartz, P.E. on the date adjacent to the seal.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	2 of 13

Scope:

Micah Swartz, P.E. is contracted by Jeld-Wen Windows & Doors to evaluate alternative anchorage for the product: V-4500 Sliding Vinyl Door 281.125" x 96". This evaluation is based on testing performed by Architectural Testing Inc. in Fresno, CA, test report no.: G6813.10-301-47 and dated 4/04/2017, revised on 4/28/17.

This evaluation does not include the air infiltration, water resistance or water penetration of the installation method or the installed product. In addition, the design of the building substrate to resist the superimposed loads is by others.

Reference Standards:

Current edition of the Florida Building Code, Building

ANSI/AWC NDS - National Design Specification (NDS) for Wood Construction

AISI S100 North American Specification for the Design of Cold-Formed Steel Structural Members

ICC-ES Report ESR-1976 ITW Buildex TEKS Self-Drilling Fasteners

ICC-ES Report ESR-2196 Hilti Self Drilling Screws to connect cold-formed steel

NOA 24-0102.06 Tapcon Concrete and Masonry Anchors with Advanced Threadform Technology

Certification of Independence:

In accordance with Rule 61G20-3 Florida Administrative Code, Micah Swartz, P.E. hereby certifies the following:

(1) Micah Swartz, P.E. does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested or labeled by the agency.

(2) Micah Swartz, P.E. is not owned, operated or controlled by any company manufacturing or distributing products it tests or labels.

(3) Micah Swartz, P.E. does not have, nor will acquire, a financial interest in any company manufacturing or distributing products for which the reports are being issued.

(4) Micah Swartz, P.E. does not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	3 of 13

Design Summary:

The table below summarizes the product: V-4500 Sliding Vinyl Door 281.125" x 96" and their corresponding performance levels as established by testing.

Table 1: Summary of Test Results

Series/Model	Test Report Number	Size (W x H)	Performance
V-4500 Sliding Vinyl Door 281.125" x 96"	G6813.10-301-47 (4/04/2017, revised on 4/28/17)	281.125" x 96"	+65 psf / -70 psf

As Tested Design:

Screw Information:

Screw Size: 8 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Lateral: 106 lbs

Alternative Fasteners:

Screw Information:

Screw Size: 8 Screw Embed: 1.5 in Edge Distance: 3/4 in (minimum)

Wood Screw Withdrawal: 197 lbs

Wood Screw Lateral: 106 lbs

TEK Screw Information:

Screw Size: 8-18

TEK Withdrawal: 125 lbs

TEK Lateral: 131 lbs

Tapcon Information:

Tapcon Size: 3/16 Embedment: 1-1/4 in (minimum) Edge Distance: 2-1/2 in (minimum)

Tapcon Lateral (Concrete): 155 lbs

Tapcon Lateral (CMU): 135 lbs

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	4 of 13

Summary of Test Results - Plastics Checklist

Table 2: Summary of Test Results - Plastics Checklist

Product	Test Report Number	Test Standard	Performance
SMC Skin (fiberglass material)	ESP010982P	ASTM D638 (before and after G155)	-2.2% (averaged)
		ASTM D1929	770 °F (410 °C)
		ASTM D2843	62
		ASTM D635	Classification HB

The testing summarized in the table above was conducted by Element Materials Technology in St Paul, MN on 02/26/13 and meets the requirements listed in Miami-Dade County Checklist #0445, For the approval of: Plastic and Foam Plastic.

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
		Page: 5 of 13

Subject: As Tested - Wood Screw Lateral Design - Single Shear

Input:

Calculation:

Screw Information:

Screw Size:

8

Root Diameter:

0.131

 in

Screw Embed:

1.5

 in

Main Member Type:

S-P-F

G:

0.42

F_{em}:

3,350

 psi

thickness (t_m):

1.5

 in

Side Member Type:

PVC

G:

N/A

F_{es}:

13,750

 psi

thickness (t_s):

0.125

 in

Lateral Design Factors - Table 12.3.1A (NDS)

D:	0.131	in	Diameter
F _{yb} :	100	ksi	Dowel Bending Yield Strength
F _{em} :	3,350	psi	Main Member dowel bearing strength
F _{es} :	13,750	psi	Side Member dowel bearing strength
l _m :	1.5	in	Main Member dowel bearing length
l _s :	0.125	in	Side Member dowel bearing length
R _d :	2.2		Reduction term - Table 12.3.1B (NDS)
R _e :	0.2436		= F _{em} /F _{es}
R _t :	12.0		= l _m /l _s
k ₁ :	1.135		See Table
k ₂ :	0.647		See Table

Reference Lateral Design Values - Table 12.3.1A (NDS)

Z_{I_m}:

299

 lbs

$Z_{Im} = \frac{Dl_mF_{em}}{R_d}$
(EQ 12.3 – 1)

Z_{II}:

116

 lbs

$Z_{II} = \frac{k_1Dl_sF_{es}}{R_d}$
(EQ 12.3 – 3)

Z_{III_m}:

130

 lbs

$Z_{III_m} = \frac{k_2Dl_mF_{em}}{(1 + 2R_e)R_d}$
(EQ 12.3 – 4)

Z_{IV}:

105

 lbs

$Z_{IV} = \frac{D^2}{R_d} \sqrt{\frac{2F_{em}F_{yb}}{3(1 + R_e)}}$
(EQ 12.3 – 6)

Z_{MIN}:

105

 lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{Is} and Z_{III_s} are not applicable to the calculation.

Subject: As Tested - Wood Screw Lateral Design - Single Shear Cont.**Adjusted Lateral Design Values**

$$Z' = Z * C_D * C_M * C_t * C_g * C_{\Delta} - \text{As per table 11.3.1 NDS}$$

C_D :	1.6	Load Duration Factor - Table 2.3.2 (NDS)
C_M :	1.0	Wet Service Factor - Table 11.3.3 (NDS)
C_t :	1.0	Temperature Factor - Table 11.3.4 (NDS)
C_g :	1.0	Group Action Factor - Section 11.3.6 (NDS)
C_{Δ} :	1.0	Geometry Factor - Section 12.5.1.1 (NDS)

$$Z': \boxed{167} \text{ lbs}$$

Fastener Bending Across Shim Space

Ω :	1.67	
L:	0.25	in Maximum Shim Gap
D:	0.131	in Diameter
F_{yb} :	100	ksi Dowel Bending Yield Strength

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16ZL}{\pi D^3} \Leftrightarrow Z = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

$$\text{Where } M = \frac{ZL}{2} \text{ (Guided Bending)}$$

$$Z_n/\Omega: \boxed{106} \text{ lbs}$$

Bearing on Masonry Strap

Ω :	3.00	
F_u :	33	ksi Tensile Strength of strap
t:	20	GA
t:	0.036	in thickness of strap
D:	0.131	in

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 4, AISI S100)$$

$$P_{nv}/\Omega: \boxed{140} \text{ lbs}$$

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	7 of 13

Subject:	Wood Screw Withdrawal	Input:	
		Calculation:	

Screw Information:

Screw Size:	8	Root Diameter:	0.131	in
Screw Embed:	1.5			in

Main Member Type: S-P-F G: 0.42 F_{em}: 3,350 psi

$W' = W * C_D * C_M^2 * C_t - As per table 11.3.1 NDS$

C _D :	1.6	Load Duration Factor - Table 2.3.2 (NDS)
C _M :	1.0	Wet Service Factor - Table 11.3.3 (NDS)
C _t :	1.0	Temperature Factor - Table 11.3.4 (NDS)

W:	82	lbs/in - Table 12.2B (NDS)
W:	123	lbs

W':	197	lbs
-----	-----	-----

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
		Page: 8 of 13

Subject: Wood Screw Lateral Design - Single Shear

Input:

Calculation:

Screw Information:

Screw Size: Root Diameter: in

Screw Embed: in

Main Member Type: G: F_{em}: psi thickness (t_m): in

Side Member Type: G: F_{es}: psi thickness (t_s): in

Lateral Design Factors - Table 12.3.1A (NDS)

D:	0.131	in	Diameter
F _{yb} :	100	ksi	Dowel Bending Yield Strength
F _{em} :	3,350	psi	Main Member dowel bearing strength
F _{es} :	13,750	psi	Side Member dowel bearing strength
l _m :	1.5	in	Main Member dowel bearing length
l _s :	0.125	in	Side Member dowel bearing length
R _d :	2.2		Reduction term - Table 12.3.1B (NDS)
R _e :	0.2436		= F _{em} /F _{es}
R _t :	12.0		= l _m /l _s
k ₁ :	1.135		See Table
k ₂ :	0.647		See Table

Reference Lateral Design Values - Table 12.3.1A (NDS)

Z_I: lbs $Z_{Im} = \frac{Dl_m F_{em}}{R_d}$ (EQ 12.3 – 1)

Z_{II}: lbs $Z_{II} = \frac{k_1 D l_s F_{es}}{R_d}$ (EQ 12.3 – 3)

Z_{III}: lbs $Z_{III_m} = \frac{k_2 D l_m F_{em}}{(1 + 2R_e) R_d}$ (EQ 12.3 – 4)

Z_{IV}: lbs $Z_{IV} = \frac{D^2}{R_d} \sqrt{\frac{2F_{em} F_{yb}}{3(1 + R_e)}}$ (EQ 12.3 – 6)

Z_{MIN}: lbs

Note: Side member is part of the Jeld-Wen assembly and verified during testing. Modes Z_{Is} and Z_{IIIs} are not applicable to the calculation.

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	9 of 13

Subject: Wood Screw Lateral Design - Single Shear Cont.

Adjusted Lateral Design Values

$$Z' = Z * C_D * C_M * C_t * C_g * C_{\Delta} - \text{As per table 11.3.1 NDS}$$

C _D :	1.6	Load Duration Factor - Table 2.3.2 (NDS)
C _M :	1.0	Wet Service Factor - Table 11.3.3 (NDS)
C _t :	1.0	Temperature Factor - Table 11.3.4 (NDS)
C _g :	1.0	Group Action Factor - Section 11.3.6 (NDS)
C _Δ :	1.0	Geometry Factor - Section 12.5.1.1 (NDS)

Z': 167 lbs

Fastener Bending Across Shim Space

Ω:	1.67	
L:	0.25	in Maximum Shim Gap
D:	0.131	in Diameter
F _{yb} :	100	ksi Dowel Bending Yield Strength

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16ZL}{\pi D^3} \Leftrightarrow Z = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

Where $M = \frac{ZL}{2}$ (Guided Bending)

Z_n/Ω: 106 lbs

Bearing on Masonry Strap

Ω:	3.00	
F _u :	33	ksi Tensile Strength of strap
t:	20	GA
t:	0.036	in thickness of strap
D:	0.131	in

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 4, AISI S100)$$

P_{nv}/Ω: 140 lbs

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
	Page:	10 of 13

Subject:

Input:
Calculation:

Shear Strength of Fastener - ESR 2196

Screw Size:

P_{nv}/Ω : lbs See ESR 2196

Tensile Pullout - ESR 2196

Screw Size:

F_u : ksi

t: GA

t: in

Tensile Strength of material NOT in contact with screw head

Thickness of material NOT in contact with screw head

P_{nv}/Ω : lbs See ESR 2196

Tensile Pullover

Note: The tensile pullover analysis checks the material IN contact with the screw head. This material is part of the Jeld-Wen assembly and has been verified by testing. Below is a check to ensure the head size of the TEK screw is equal to or larger than the head of the tested fastener, ensuring compliance.

Tested Fastener Head Size:

Screw Size:

Head Size: in

Tested fastener is a

TEK Screw Head Size:

Screw Size:

Head Size: in

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
		Page: 11 of 13

Subject:

TEK Lateral Design

Input:

Calculation:

Shear Strength of Fastener - ESR 2196

Screw Size:

8-18

P_{nv}/Ω:

390

lbs
 See ESR 2196

Bearing Strength of Material NOT in Contact with Screw Head - AISI S100

Screw Size:

8-18

Ω:

3.00

D:

0.123

in
 Root Diameter of TEK Screw

F_u:

45

ksi
 Tensile Strength of material NOT in contact with screw head

t:

18

GA

t:

0.0478

in
 Thickness of material NOT in contact with screw head

$$\frac{P_{nv1}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 3, AISI S100)$$

$$\frac{P_{nv2}}{\Omega} = 4.2 \sqrt{t^3 * D} * F_u - (EQ.J4.3.1 - 1, AISI S100)$$

P_{nv1}/Ω:

238

lbs

P_{nv2}/Ω:

231

lbs

P_{nv}/Ω:

231

lbs
 $\frac{P_{nv}}{\Omega} = \text{smallest of } \frac{P_{nv1}}{\Omega} \text{ and } \frac{P_{nv2}}{\Omega}$

Bearing Strength of Material IN in Contact with Screw Head

Note: Material IN contact with the screw head is part of the Jeld-Wen assembly and has been verified by testing.

Fastener Bending Across Shim Space

L:

0.25

in
 Maximum Shim Gap

D:

0.123

in
 Root Diameter of TEK Screw

F_{yb}:

100

ksi
 Yield Strength of TEK Screw

Ω:

3.00

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16P_n L}{\pi D^3} \Leftrightarrow P_n = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

Where $M = \frac{P_n L}{2}$ (Guided Bending)

P_n/Ω:

146

lbs

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025

Bearing Strength of Masonry Straps - AISI S100

Screw Size:	8-18	TEK Screw	Ω:	3.00
D:	0.123	in	Root Diameter of TEK Screw	
F _u :	33	ksi	Tensile Strength of Masonry Strap	
t:	20	GA		
t:	0.0359	in	Thickness of Masonry Strap	

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ.J4.3.1 - 3, AISI S100)$$

P_{nv}/Ω: 131 lbs

Micah Swartz, P.E.	Project Number:	MS24-12004
	Project Name:	Premium Vinyl V-4500
	Date:	9/8/2025
		Page: 13 of 13

Subject: Tapcon Lateral Design

Input:

Calculation:

Tapcon Size:

Size: 3/16

D: 0.1875 in

Nominal Diameter

D_{sh}: 0.145 in

Shank Diameter

Fastener Shear Capacity - 3,000 psi Concrete

P_{nv}/Ω: 181 lbs

See Table 1B of NOA 24-0102.06

Fastener Shear Capacity - Medium-Weight CMU

P_{nv}/Ω: 135 lbs

See Table 3 of NOA 24-0102.06

Note:

- Critical anchor spacing is 16D
- Minimum Anchor Embedment is 1-1/4"
- Minimum Edge Distance is 2-1/4"

Fastener Bending Across Shim Space

L: 0.25 in

Maximum Shim Gap

Ω: 3.00

D_{sh}: 0.145 in

Shank Diameter of Tapcon

F_{yb}: 100 ksi

Yield Strength of Tapcon

$$\frac{F_{yb}}{\Omega} = \frac{M}{S} = \frac{16P_n L}{\pi D^3} \Leftrightarrow P_n = \frac{F_{yb} \pi D^3}{16 \Omega L}$$

Where $M = \frac{P_n L}{2}$ (Guided Bending)

P_n/Ω: 239 lbs

Bearing Strength of Masonry Straps - AISI S100

Size: 3/16

Tapcon Size

Ω: 3.00

D_{sh}: 0.145 in

Shank Diameter of Tapcon Screw

F_u: 33 ksi

Tensile Strength of Masonry Strap

t: 20 GA

t: 0.0359 in

Thickness of Masonry Strap

$$\frac{P_{nv}}{\Omega} = 2.7 * t * D * F_u - (EQ. J4.3.1 - 3, AISI S100)$$

P_{nv}/Ω: 155 lbs